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Heat-proof casings for electrical equipment

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GB2151410 A
GB1498177 A
GB1304282 A
GB1267158 A

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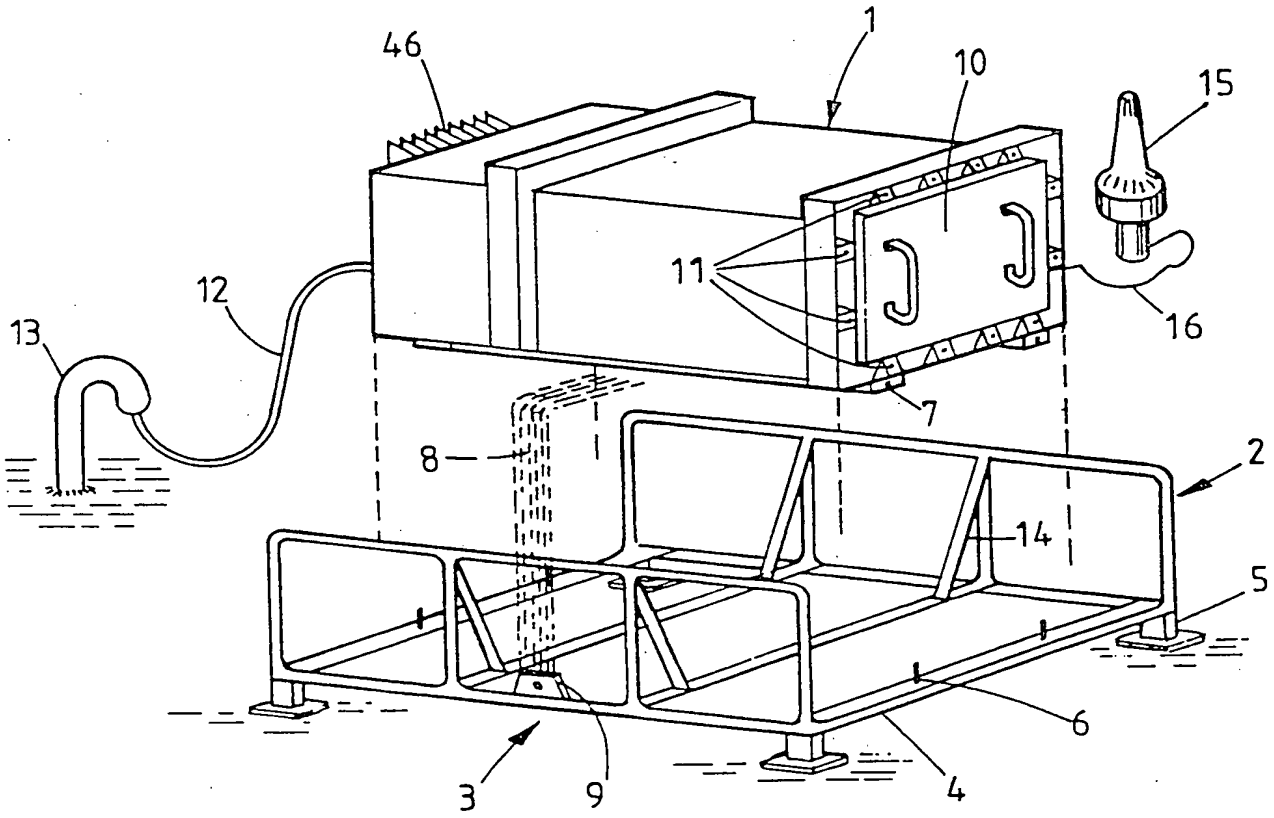

FIG. 1.

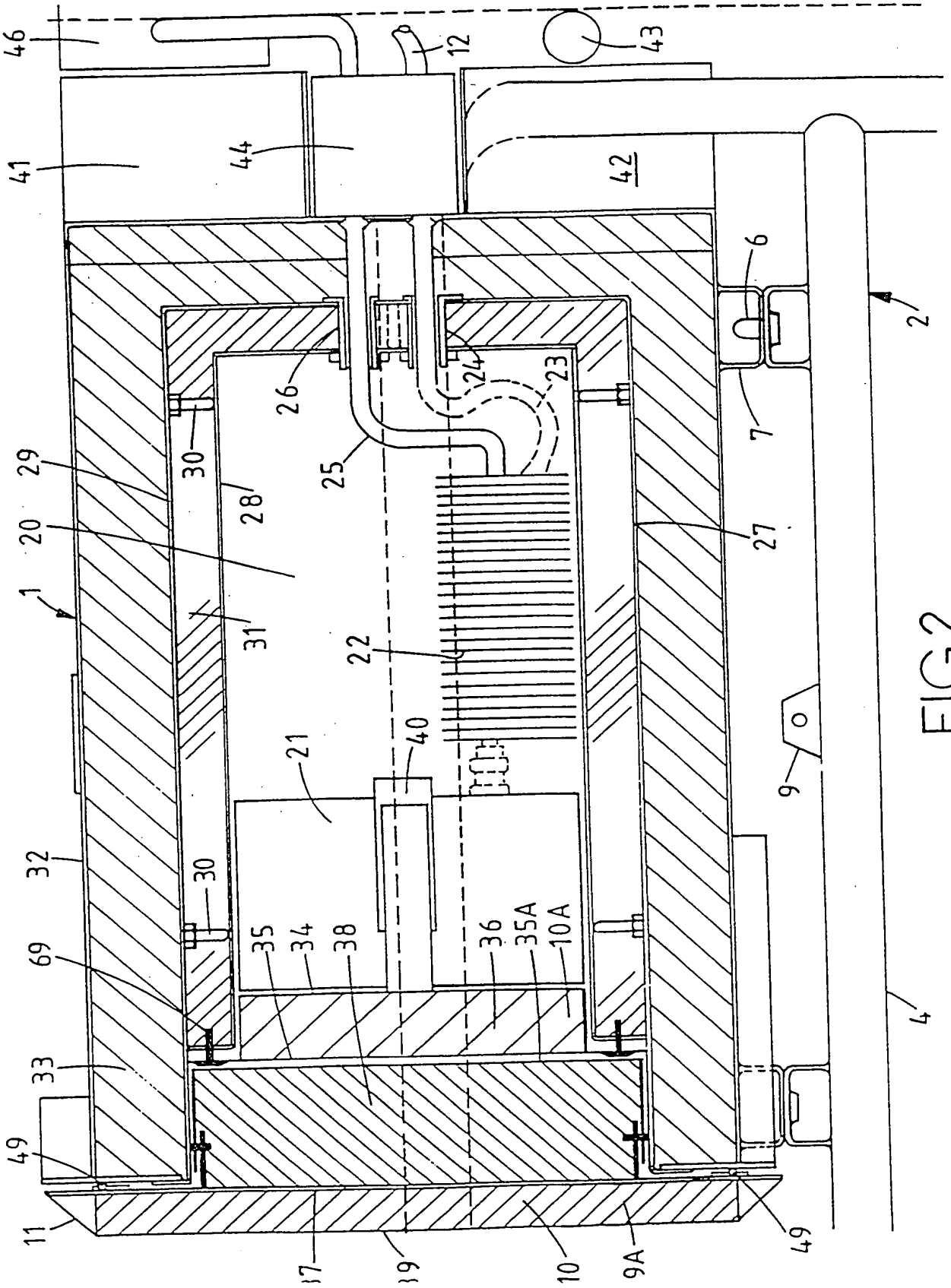
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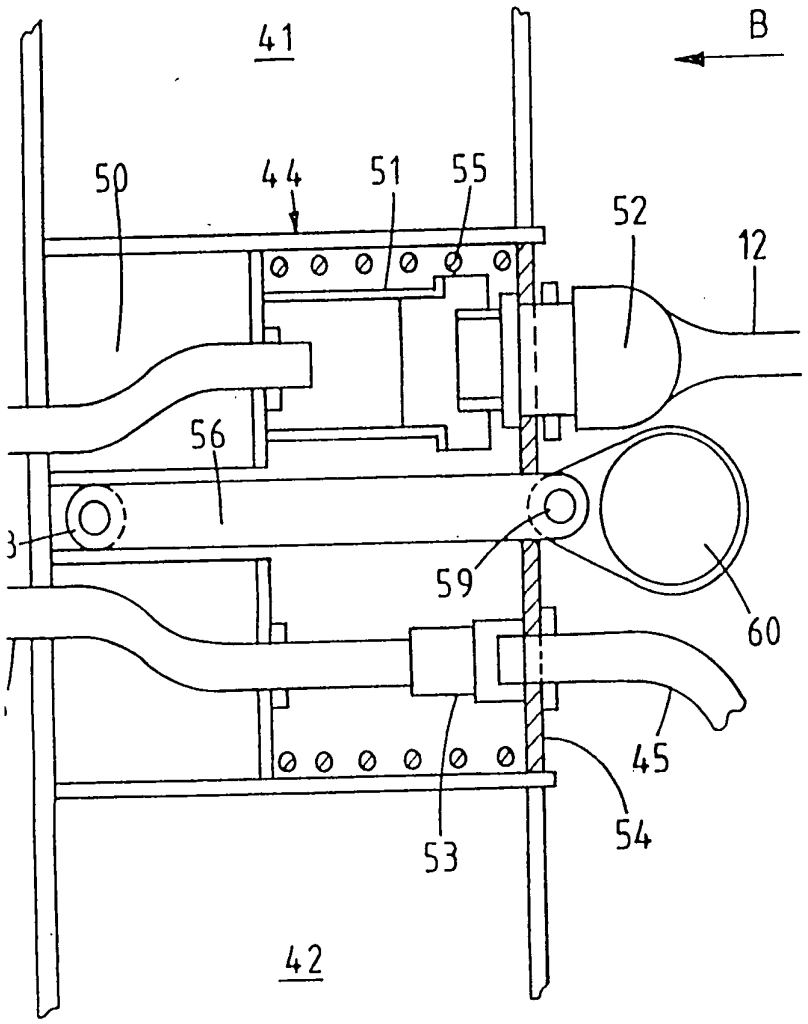
FIG.2.



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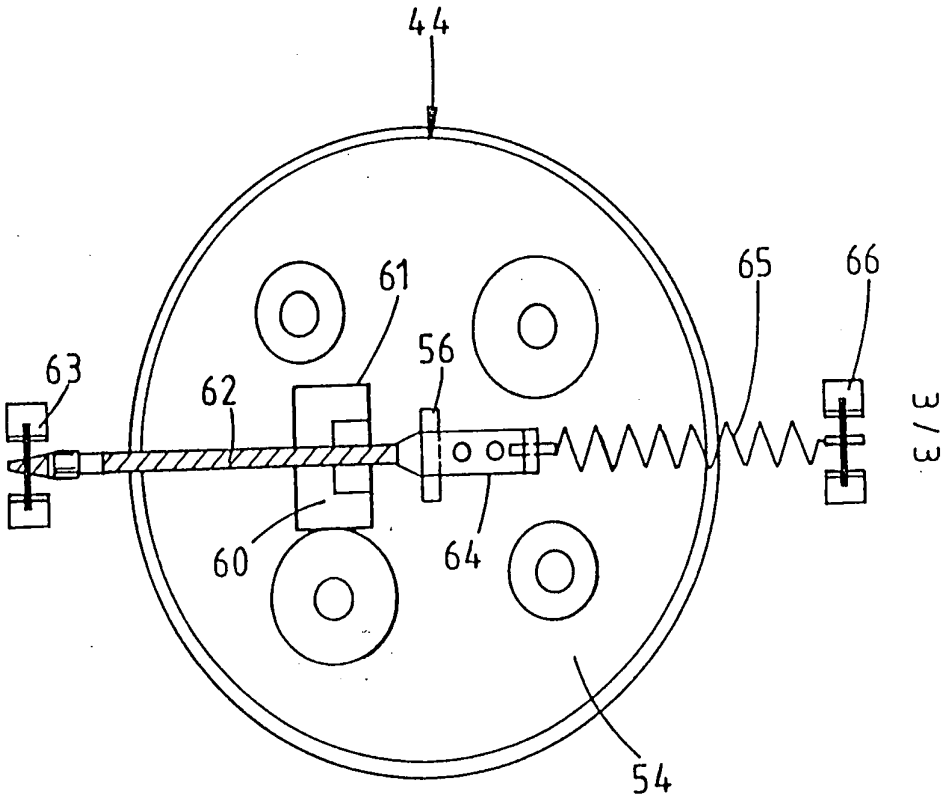

(B)

FIG.3.

"Heat-Proof Casings for Electrical Equipment"

This invention relates to heat-proof casings for electrical equipment, and is concerned more particularly, but not exclusively, with such casings for electrical recording equipment for monitoring electrical signals generated on board ship in an emergency.

Following several recent serious losses of ships at sea, increasing interest has been shown in the marine field in the provision of standard equipment mounted on board ship for monitoring onboard events in an emergency. Particularly in cases where the emergency leads to sinking of the ship, the equipment may provide valuable evidence which can subsequently be analysed to determine the cause of the emergency. Of course, it is important that at least the record of events made by the monitoring equipment during the emergency should survive the emergency and should be capable of being retrieved for subsequent analysis.

It is an object of the invention to provide a heat-proof casing for at least the recording part of such equipment to provide protection against the effects of an onboard fire.

According to the present invention there is provided a heat-proof casing for electrical equipment, the casing comprising an inner chamber for accommodating electrical equipment which is to be shielded from the effects of external heat, a duct for electrical wiring extending from the electrical equipment within the inner

chamber to the outside of the casing, and an inner jacket surrounding the inner chamber and having hollow walls filled with a substance, such as paraffin wax, which is in the solid state at normal ambient temperatures but which changes to the liquid state when subjected to external heat above a certain level and which thereby absorbs external heat, the inner jacket being provided with door means by means of which the electrical equipment may be introduced into, and withdrawn from, the inner chamber.

It will be appreciated that the inner chamber will be shielded to a substantial extent from the effects of external heat, generated by a fire on board ship for example, by virtue of the fact that heat will be absorbed by the substance within the inner jacket not only in raising the temperature of the substance but also in latent energy required to convert the substance to the liquid state.

In a preferred embodiment of the invention the casing also includes an outer layer of heat-insulating material, such as a ceramic fibre insulating material.

Preferably the inner jacket has inner and outer walls which are rigidly spaced apart, by heat-insulating posts made of acetyl resin for example, to provide a hollow space for accommodating said substance.

Furthermore the door means preferably has a hollow wall filled with said substance, as well as having an outer layer of heat-insulating material.

Advantageously the casing also includes cooling

means for transferring heat generated by the electrical equipment within the inner chamber to the outside of the casing.

The casing may also be provided with releasable connector means for establishing an electrical connection to the casing, and hence to the electrical equipment by way of the duct.

The invention also provides an emergency ship monitoring unit comprising a cradle adapted to be mounted on the deck of a ship, and a casing in accordance with the invention releasably connected to the cradle. Electrical recording equipment may be provided within the casing for monitoring electrical signals generated on the ship, and the casing may be connected to the cradle by releasable connection means adapted to release the casing from the cradle in response to immersion in water.

The casing preferably has sufficient buoyancy to permit the casing to float in water when released from the cradle.

In addition emergency position indicating means, such as a radio beacon, may be attached to the casing to indicate the position of the casing in the water after it has been released from the cradle.

In order that the invention may be more fully understood, a preferred embodiment of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is an exploded perspective view of an

emergency ship monitoring unit incorporating the heat-proof casing;

Figure 2 is a vertical section through the casing; and

Figure 3 shows enlarged views of a releasable connector incorporated in the casing.

Referring to Figure 1, the heat-proof casing 1 is releasably connected to a cradle 2 which is mounted on the deck 3 of a ship. The cradle 2 comprises a frame 4 having four feet 5 and four locating pins 6 for freely engaging within apertures in feet 7 on the underneath of the casing 1 when the casing 1 rests within the cradle 2. The casing 1 is normally held within the cradle 2 by a webbing band 8 secured to a lug 9 by a hydrostatic release mechanism of a type which is known per se.

In use on board ship, the casing 1 is secured within the cradle 2 at a point on the ship, for example on top of the bridge, from which it can easily float free in the event that the ship sinks. Electrical equipment (not shown in Figure 1) is installed within the interior of the casing 1 to which access is obtained by removing an outer door 10 and an inner door 10A after releasing heavy duty catches 11, and an electrical connection is made from the recording equipment to onboard monitoring apparatus, such as the ship's computer, radar equipment and microphones on the ship's bridge and in the engine control room, by means of a cable 12 extending through a gooseneck 13.

In the event of the ship sinking, the hydrostatic release mechanism is operated in response to immersion in water to sever the attachment of the webbing band 8 at one end and to permit the casing 1 containing the recording equipment to float free of the ship's bridge, the cable 12 being released by a mechanism described below. In this regard the frame 4 of the cradle 2 includes inclined support members 14 on which the casing 1 normally rests and which ensure that the casing 1 does not become accidentally lodged within the cradle 2 even after release of the hydrostatic release mechanism. An emergency position indicating radio beacon 15 (EPIRB) is attached to the casing 1 by a cord 16 and provides an indication of the position of the casing after release in known manner.

Referring to Figure 2, the heat-proof casing 1 comprises an inner chamber 20 accommodating the recording equipment in the form of a tape recorder mechanism 21 and an associated finned cooling structure 22. The tape recorder mechanism 21 is electrically connected to the outside by a lead 23 extending through a duct 24 in the wall of the casing, and the cooling structure 22 is connected to an external cooling source 46 by a heat pipe 25 extending through a further duct 26 in the wall of the casing.

The casing 1 has an inner jacket 27 having inner and outer walls 28 and 29 spaced apart by heat-insulating posts 30 made of acetyl resin to provide a hollow space

which is filled with paraffin wax 31. Also a space between the outside of the jacket 27 and an outer wall 32 of the casing 1 is filled with a double layer of ceramic fibre insulating material 33 such as that sold under the trade name Micropore. Each layer of insulating material 33 is formed by slabs of material which are butted together at the edges of the casing, and the butted joints between the slabs are offset between the two layers in order to optimise heat insulation along the edges.

The inner door 10A also has a space between its walls 34 and 35 which is filled with paraffin wax 36, and the outer door 10 has a space between its walls 35A and 37 which is filled with ceramic fibre insulating material 38. A further space between the wall 37 and an outer wall 39 of the outer door 10 is also filled with ceramic fibre insulating material 39A. The wall 35A consists of a glass fibre moulding which provides a heat penetration barrier between the metallic parts of the inner and outer doors 10A and 10. The inner door 10A is fixed to the inner jacket 27 by countersunk screws 69.

When the inner and outer doors 10A and 10 are removed, the tape recorder mechanism 21 may be slid out of the chamber 20 on slide rails 40, so that a fresh tape cassette may be inserted in the mechanism 21 for example. The tape mechanism 21 is so controlled that it records the required electrical signals generated on board ship continuously with the previously recorded signals being overridden by newly recorded signals after a

predetermined interval of time, such as 24 hours, so that the equipment maintains a continuously updated record of the signals generated onboard ship over the preceding 24 hours. However, the tape cassette may be replaced in the event that it has become worn or faulty or in the event that it is required to retain a record of the signals over a preceding 24 hour period, for example in the case of an emergency which has not resulted in sinking of the ship.

The casing 1 may be provided with buoyancy tanks 41 and 42 to assist floating in the water, as well as with an underwater ultrasonic locating beacon 43 of a known type which is such that, when it is immersed in water, it is automatically activated and produces a regular short pulse of ultrasonic sound for locating purposes. Furthermore the heat pipe 25 connects the internal cooling structure 22 by way of a releasable connector 44 and a further heat pipe 45 to the external cooling source 46 which may be in the form of a finned cooling structure for example. The function of this cooling mechanism is to transfer heat generated by the electrical equipment within the chamber 21 to the outside of the casing. Any known mechanism, such as a diode heat pipe arrangement, may be used for transferring the heat from the internal cooling structure 22 to the external cooling structure 46. Furthermore the electrical lead 23 is connected by way of the releasable connector 44 to the external cable 12.

Figure 3 shows the releasable connector 44 on an

enlarged scale, Figure 3(A) showing a vertical section through the connector 44 and Figure 3(B) showing a view of the connector 44 from outside in the direction of the arrow B in Figure 3(A). The connector 44 includes ceramic fibre insulating material 50, an electrical socket 51 by means of which the cable 12 provided with a plug 52 may be electrically connected to the lead 23, and a pipe socket 53 by means of which the heat pipes 45 and 25 may be connected together. The plug 52 is held within the socket 51 and the pipe 45 is held within the socket 53 by a release plate 54 which is held in position against the action of a compression spring 55 by a retaining link 56. The retaining link 56 has a pivotal connection 58 to the casing at one end and a pivotal connection 59 to a hydrostatic release mechanism 60 at the other end.

As may be seen more particularly in Figure 3B, the hydrostatic release mechanism 60 incorporates a blade unit 61 and a release cord 62 which extends from an anchor point 63 on the casing through the blade unit 61 to a locking pin 64 which is retained in engagement with the retaining link 56 by a tension spring 65 secured to a further anchor point 66 on the casing. In response to immersion in water, the blade unit 61 is activated to cut the cord 62 and the locking pin 64 is thereby disengaged from the retaining link 56 by the spring 65, thus causing the release plate 54 to be projected outwardly of the casing by the compression spring 55 and disengaging the plug 52 from the socket 51 and the pipe 45 from the socket

53.

Furthermore, in the event of a fire, the electrical equipment within the chamber 20 will be shielded from the effects of heat transmitted through the walls of the casing by virtue of the provision of the paraffin wax 31 within the jacket 27 and the paraffin wax 36 in the inner door 10A which absorbs heat not only in raising the temperature of the wax but also in converting the wax to the liquid state. In this regard the wax will have a melting point of about 53°C, and it is found that in practice this provides a significant degree of thermal protection. Thus, in tests carried out with the casing described, it has been found that the temperature within the chamber 20 does not rise above 75°C when an external temperature of 1100°C is applied for one hour. In addition the chamber 20 is protected from the effects of heat transmission around the edges of the outer door 10 by the provision of intumescent seals 49 (see Figure 2) of known type which foam up in the event of a fire to provide an insulating barrier.

The walls of the casing are fabricated from stainless steel, and the casing is rendered weatherproof by use of TIG welding techniques in fabrication of the casing and by the provision of waterproof seals.

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CLAIMS

1. A heat-proof casing for electrical equipment, the casing comprising an inner chamber for accommodating electrical equipment which is to be shielded from the effects of external heat, a duct for electrical wiring extending from the electrical equipment within the inner chamber to the outside of the casing, and an inner jacket surrounding the inner chamber and having hollow walls filled with a substance which is in the solid state at normal ambient temperatures but which changes to the liquid state when subjected to external heat above a certain level and which thereby absorbs external heat, the inner jacket being provided with door means by means of which the electrical equipment may be introduced into, and withdrawn from, the inner chamber.

2. A casing according to claim 1, wherein said substance is paraffin wax.

3. A casing according to claim 1 or 2, which also includes an outer layer of heat-insulating material.

4. A casing according to claim 3, wherein said material is a ceramic fibre insulating material.

5. A casing according to any preceding claim, wherein the inner jacket has inner and outer walls which are rigidly spaced apart to provide a hollow space for accommodating said substance.

6. A casing according to claim 5, wherein the inner and outer walls are spaced apart by heat-insulating posts.

7. A casing according to any preceding claim,

wherein the door means has a hollow wall filled with said substance.

8. A casing according to any preceding claim, wherein the door means has an outer layer of heat-insulating material.

9. A casing according to any preceding claim, which includes cooling means for transferring heat generated by the electrical equipment within the inner chamber to the outside of the casing.

10. A casing according to any preceding claim, wherein releasable connector means are provided for establishing an electrical connection to the electrical equipment within the casing by way of the duct.

11. An emergency ship monitoring unit comprising a cradle adapted to be mounted on the deck of a ship, and a casing according to any preceding claim releasably connected to the cradle.

12. A unit according to claim 11, wherein electrical recording equipment is provided within the casing for monitoring electrical signals generated on the ship.

13. A unit according to claim 11 or 12, wherein the casing is connected to the cradle by releasable connection means adapted to release the casing from the cradle in response to immersion in water.

14. A unit according to claim 11, 12 or 13, wherein the casing has sufficient buoyancy to permit the casing to float in water when released from the cradle.

15. A unit according to claim 11, 12, 13 or 14,

wherein emergency position indicating means are attached to the casing to indicate the position of the casing in the water after it has been released from the cradle.

16. A heat-proof casing for electrical equipment, the casing being substantially as hereinbefore described with reference to the accompanying drawings.

17. An emergency ship monitoring unit substantially as hereinbefore described with reference to the accompanying drawings.